

Elliott Bay Seawall Project

November 2010

INTRODUCTION

This document analyzes waterfronts in six peer cities, both locally and around the world, and summarizes lessons from these projects that may inform the Elliott Bay Seawall Project design. Each case study examines the following:

- Seawall or shoreline protection
- Habitat
- Public use along the shoreline edge (recreation and/or urban design)
- Design and construction

The six waterfronts were selected for their similarity to Seattle in context, issues, ecology, or urban setting:

1. **Olympic Sculpture Park** – Seattle, Washington, USA
2. **Vancouver Convention Center** – Vancouver, British Columbia, Canada
3. **Juneau Waterfront** – Juneau, Alaska, USA
4. **Chicago Shoreline Protection project** – Chicago, Illinois, USA
5. **Waterfront Toronto, East Bayfront** – Toronto, Ontario, Canada
6. **Västra Hamnen** – Malmö, Sweden

Each case study concludes with “lessons learned” and a resource summary for further investigation. As the Elliott Bay Seawall Project proceeds, additional research may be conducted around specific issues, such as seawall and revetment design and detailing, waterfront and urban design, habitat features and substrates, habitat illumination, biological monitoring, and recreational opportunities.

Olympic Sculpture Park – Seattle, Washington



Olympic Sculpture Park. Source: Central Waterfront Partnership Committee briefing book



Pocket beach. Source: J. A. Brennan Associates



Pocket beach. Source: J. A. Brennan Associates



Seawall and cantilevered walk. Source: J. A. Brennan Associates

Basic Facts

Location: Seattle, Washington, USA

Main points: brownfield redevelopment, salmon habitat, natural beach, waterfront promenade, public-private collaboration

Size / length of waterfront: park size is 8.5 acres, waterfront is approximately one-quarter mile

Year implemented: 2007

Clients: Seattle Art Museum, Museum Development Authority; significant collaboration with the City of Seattle

Cost: \$65 million

Relevant Issues

Habitat and Environment:

- Natural shoreline beach
- Brownfield redevelopment
- Salmon migration habitat
- Native plants
- Rainwater capture and re-use

Public Use:

- Public touch point to Elliott Bay (public beach)
- Outdoor art gallery
- Educational opportunities
- Waterfront promenade

Design and Construction:

- Relocation of existing riprap for habitat improvement
- Reduced stormwater run-off
- Ecologically-friendly management practices

Description: Olympic Sculpture Park – Seattle, Washington

Overview

When the Seattle Art Museum, the Museum Development Authority, and the Trust for Public Land began examining sites for their planned sculpture park, the former Union Oil of California industrial site along Seattle's central waterfront offered a unique opportunity to preserve and rehabilitate one of Seattle's last undeveloped waterfront properties. With the inclusion of acquired property along Broad Street and land leased from the City of Seattle, the 8.5 acre site was transformed into a setting for outdoor art and public recreation and restored to a functioning ecosystem. To support this ecosystem, shoreline stabilization consists of natural substrate beach secured by rip-rap sills and a seawall segment with a submerged rock revetment.

Habitat and Environment

Shoreline habitat restoration and terrestrial improvements were major project goals. The new beach provides upland riparian and intertidal habitats, while a shallow subtidal habitat bench along the beach and seawall offers refuge and foraging habitat for migrating juvenile salmon. Early results from a five-year beach restoration monitoring program indicate rapid development of aquatic and terrestrial flora and fauna.

Extensive native planting and the reintroduction of the site's historic topography created native microclimates and archetypal landscapes, known as the Shore, the Grove, the Meadow, and the Valley. The Shore features plants commonly found in Pacific Northwest coastal zones that tolerate constant wind and salt-spray. These plants, which include shore pine, beach grass, and beach strawberry, support salmon habitat and tidal gardens.

Upland of the Shore is the Grove, where native quaking aspen with a wood rose and Oregon iris understory express dramatic seasonal changes. In the Meadow, native grasses and wildflowers form a regenerative landscape complementing the sculptures within. Garry oak, western columbine, and camas grass inhabit this ecosystem. The Valley illustrates the moist evergreen forests of the Puget Sound region.



Purple sea stars. Source: J. A. Brennan Associates

Douglas fir, western red cedar, and western hemlock are joined by ginkgo and dawn redwood, known as “living fossils.” Flowering perennials, ferns, and shrubs typical of this ecosystem define pathways and outdoor rooms.

Public Use

The designer's vision was to “transport art outside the museum walls” and create a unique urban space where patrons could view sculpture, the city, and Puget Sound all at once. To link divided land parcels, a Z-shaped path begins at the expanded Elliott Bay Trail along the Shore, climbs over Alaskan Way and Elliott Avenue, and ends in the Valley with an amphitheater and pavilion. Twenty-one sculptures line the path, within several zones of native plantings. The park also includes a museum shop, cafés, classrooms, indoor exhibition space, a parking structure, and office space. The park is popular with both locals and tourists and is a frequent setting for wedding photos.

Design and Construction

The site's industrial history necessitated significant remediation both before and after purchase. A three-foot thick layer of engineered soil was used to reduce runoff quantity, and dense planting of native trees, shrubs, and ground cover in permeable rain gardens further reduces stormwater runoff from the site. At the shoreline, rip-rap rock was relocated to create shallow

subtidal habitat and a pocket beach. Shoreline improvements also stabilized the site's existing seawall, which was damaged in the 2001 Nisqually earthquake. Maintenance contributes to a healthy ecosystem through the use of green cleaning products, composting, and pesticide-free gardening to reduce pollutants in the groundwater and Elliott Bay.



Olympic Sculpture Park. Source: Central Waterfront Partnership Committee briefing Book

Lessons

- Salmon migration habitat improved with a shallow subtidal habitat bench
- Project restored three habitat types: subtidal reef, intertidal habitat bench, and upland riparian vegetation
- Constructed pocket beach creates public water touch point and connection to adjacent Myrtle Edwards Park

Resources

Central Waterfront Partnerships Committee briefing book.

www.seattle.gov/dpd/Planning/Central_Waterfront/PartnershipsCommittee/BriefingBook/index.htm

Olympic Sculpture Park website, Seattle Art Museum.

www.seattleartmuseum.org/visit/osp/AboutOSP/default.asp

The Seattle Times.

<http://seattletimes.nwsourc.com/html/sculpturepark/>

Vancouver Convention Center and False Creek Shoreline – Vancouver, Canada



Vancouver Convention Center and seawall. Source: LMN Architects



Bio-engineered habitat skirt. Source: LMN Architects

Basic Facts

Location: Vancouver, British Columbia, Canada

Main points: seawall design, habitat, public access, parkland

Size / length of waterfront: 6+ acres of nearshore marine habitat

Owner: BC Pavilion Corporation (PavCo)

Year implemented: 2008

Client / sponsor: Vancouver Convention Centre Expansion Project Ltd.

Cost: \$15 million CAN (marine habitat design and implementation), \$883.2 million CAN (entire convention center)

Relevant Issues

Habitat and Environment:

- Shoreline habitat replaced at two-to-one (2:1) ratio
- Intertidal and subtidal marine habitat
- Creation of new off-shore island increased quantity of shoreline habitat
- Stormwater collected in backshore wetland
- Twice annual monitoring of habitat for initial three-year period

Public Use:

- Coordination with other city improvements
- Water and habitat access
- Parks
- Bicycle and pedestrian paths
- Marina
- Historical design influence

Design and Construction:

- Engineered “bio-habitat skirt” along submerged building foundation
- Connection to existing seawall
- Over-water building construction
- Maintaining public access

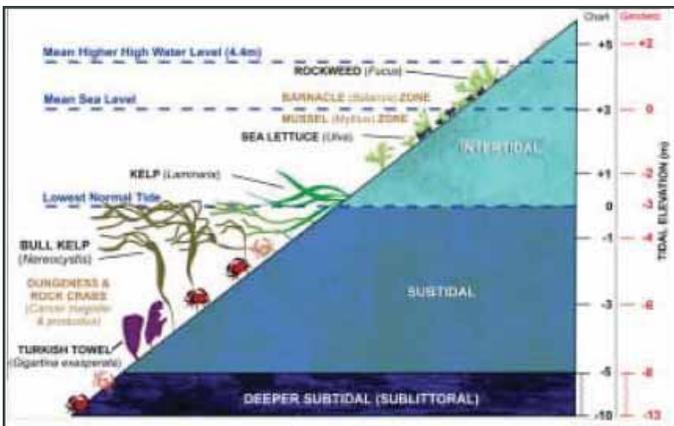
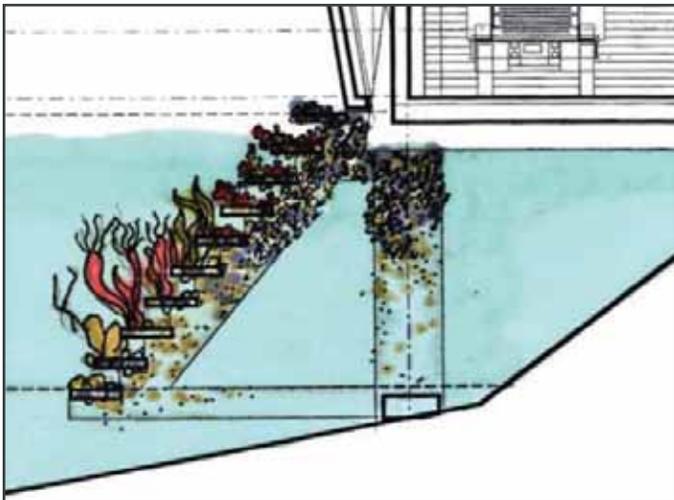
Description: Vancouver Convention Center and False Creek Shoreline – Vancouver, Canada

Overview

The 383,000 square foot Vancouver Convention Center Expansion (VCCE) is located on Vancouver’s waterfront and extends over Burrard Inlet. This project was conceived in preparation for the 2010 Winter Olympic Games and as part of the city’s ongoing waterfront development. The site provides a centralized park and public gathering area, and anchors the city’s popular 13.5 mile seawall and multi-use path. Key to permitting and constructing this project was the required replacement of disturbed shoreline at a two-to-one (2:1) ratio. This was accomplished with a “bio-engineered habitat skirt” around the building foundation and creation of an off-shore habitat island. To support habitat benefits, much of the shoreline is stabilized with rubble mound, rip-rap, or smaller substrate.

Habitat and Environment

Following the remediation of nearly 4,000 cubic yards of contaminated marine sediments, 6.3 acres of nearshore and intertidal habitat were created. Using the over-water convention center as a habitat opportunity, an innovative bio-engineered habitat skirt was installed around its perimeter, with an intertidal zone established below its deck. The habitats in this skirt create four “marine corners”: the southwest corner reef, the northwest deep water shoal, the northeast point islet, and the southeast intertidal habitat. Varying by location and depth, a diverse colony of intertidal and subtidal marine life has been established. An ongoing marine habitat monitoring program, including dive surveys, will provide detailed accounts of intertidal and subtidal biota over a three to five year period.



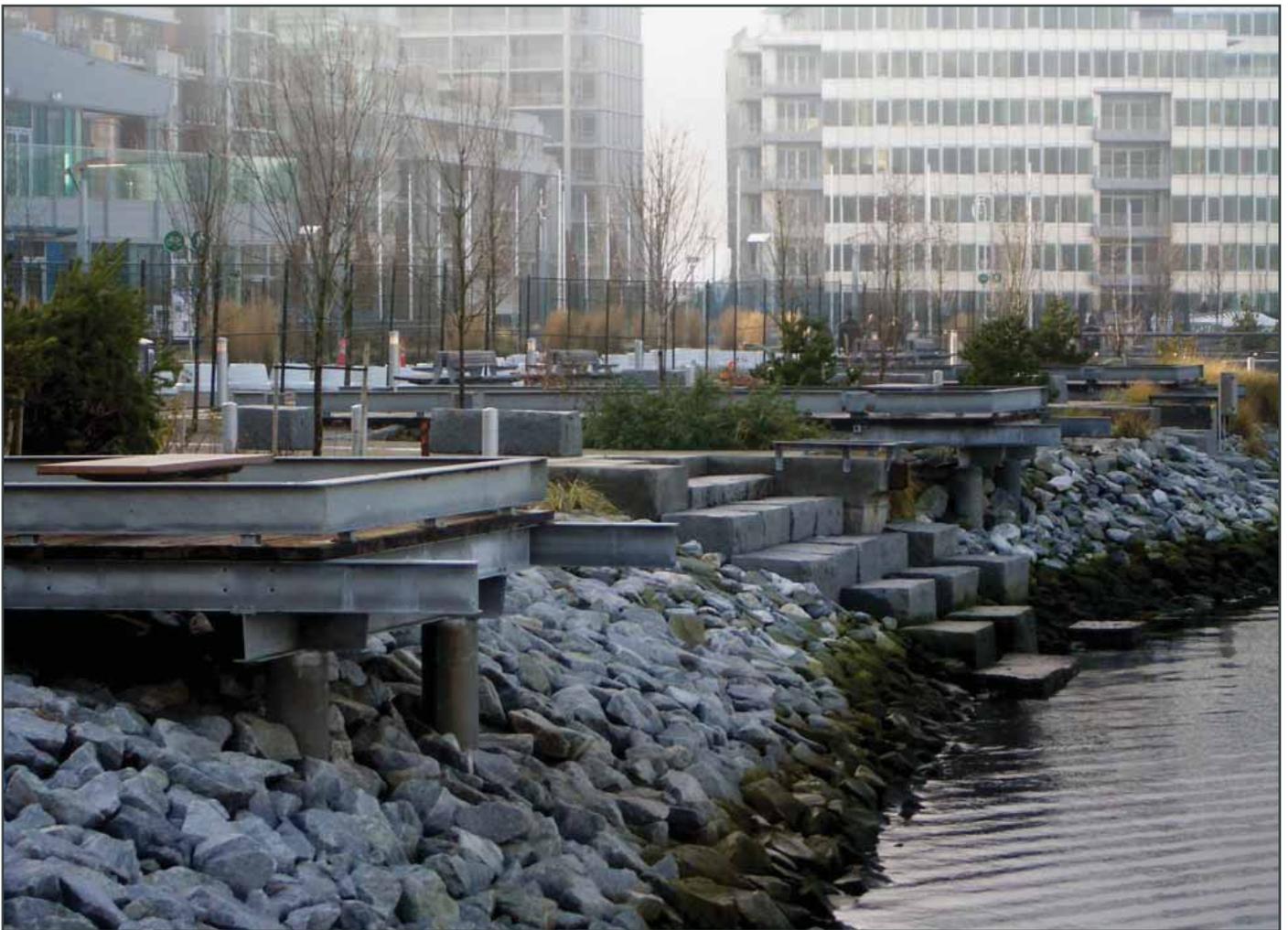
Bio-engineered habitat skirt. Source: LMN Architects

False Creek habitat island. Source: J. A. Brennan Associates

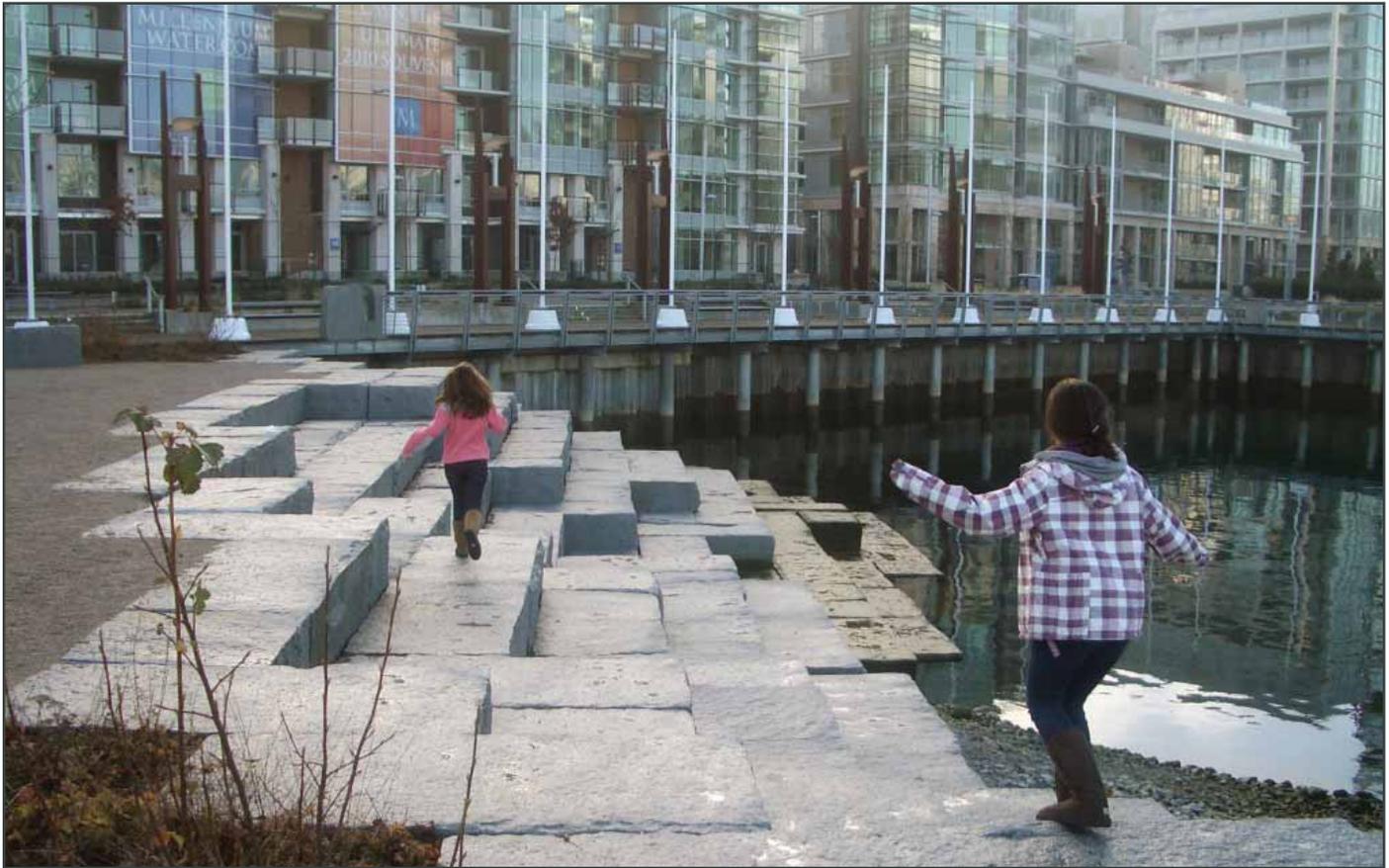
Offshore, a new half-acre habitat island provides additional shoreline and terrestrial habitat. Surrounded by rock substrate of varying sizes, the island increases intertidal area. Accessed by stepping stones from the adjacent parkland, the island is a popular interpretive and recreational destination where herring schools have been sighted after an 80-year absence. Populated with native fir and cedar, the island provides a glimpse of Vancouver's surrounding forests (and an occasional bald eagle). Inland from the shore, new wetlands capture stormwater from surrounding paved areas. Reed groves cleanse and filter the water, which then flows over a weir structure into nearby False Creek.

Public Use

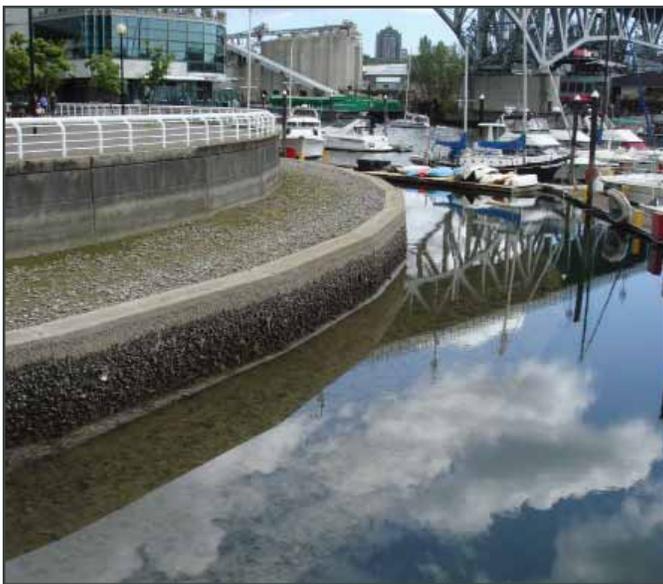
The VCCE was coordinated with additional projects within an 80 acre urban site, including 26 acres of public open space. Developed for both short-term needs driven by the 2010 Olympic Games and a long-term vision for Vancouver's waterfront, the site respects plans for future condominiums and waterfront improvements. Located to the northwest of the Convention Center, new floating marinas are planned with mooring for various sized boats, a seaplane terminal, a gazebo, restaurants, retail, and stairs, elevators, and ramps to the floating walkways.



False Creek plaza. Source: J. A. Brennan Associates



False Creek plaza with wall and cantilevered walk beyond. Source: J. A. Brennan Associates



False Creek marina. Source: J. A. Brennan Associates



False Creek plaza. Source: J. A. Brennan Associates

Design and Construction

Marine biologists were included in the design team for the convention center, which includes eight acres of over-water coverage. The bio-engineered habitat skirt serves as part of the building's underwater foundation, creating an artificial reef under the building itself. The stepped terraces or trays look like bleachers and are filled with substrates to support targeted marine life.

Nearby False Creek Park provides shoreline habitat as well as park land interpreting the site's industrial history. The park's design tells the story of former rail yards to the east, a central ship yard, and western works yard. Materials and details illustrate the story with lumber and brass plaques in the eastern rail yard and a spillway and nautical cleats in the ship yard. A stepped stone amphitheater stabilizes the shore while also providing gathering space and access to formerly polluted water.

Lessons

- Shoreline improvements coordinated with surrounding urban improvements
- Project anchors to Vancouver's existing seawall and mixed-use path system
- Use of the convention center building foundation and below-deck areas for habitat
- New island at False Creek creates additional shoreline habitat
- Habitat monitoring was project component
- Wetlands created for stormwater treatment
- Park design influenced by industrial history

Resources

"Vancouver's Evolving Shoreline," Re-Place magazine.

Erick Villagomez, July 16, 2009.

<http://regardingplace.com/?p=4932>

Marine Habitat Design and Implementation Vancouver Convention Center Expansion Project.

EBA Consulting Engineers and Scientists.

"Leaving an Olympics Legacy—Landscape Architects are Transforming Vancouver for this month's Winter Games and beyond," Landscape Architecture Magazine.

Tim Newcomb, February 2010.

Vancouver Board of Parks and Recreation.

<http://vancouver.ca/parks/parks/stanley/seawall.htm>

Juneau Waterfront – Juneau, Alaska



Juneau, Alaska aerial view showing waterfront boardwalks and open water portals.
Source: Google Earth



Shallow water migration corridor. Source: J. A. Brennan Associates



Open water portal. Source: J. A. Brennan Associates

Basic Facts

Location: Juneau, Alaska, USA

Main points: urban waterfront, salmon migration corridor, cruise ship tourism

Size / length of waterfront: 2.5 miles

Year implemented: currently under development

Clients: City and Borough of Juneau, Juneau's Port Development Committee

Cost: currently under development

Relevant Issues

Habitat and Environment:

- Salmon migration corridor
- Over-water structure impacts
- Aquatic habitat
- Tidal habitat
- Riparian habitat

Public Use:

- Water touch points
- Historical context
- Urban revitalization
- Tourism
- Marina and float plan slips
- Waterfront promenade

Design and Construction:

- Phased implementation

Description: Juneau Waterfront – Juneau, Alaska

Overview

A center of commerce, livelihood, industry, tourism, and social interaction, Juneau's waterfront is its heart. An eclectic mix of government offices, retail shops, a cruise ship terminal, a marina, and industrial uses intersect tidal habitats, estuaries, and forests. Juneau's shoreline is a mixture of natural and constructed treatments. Surrounded by wilderness, this waterfront also plays a vital role in a fragile ecology. A protection zone at the mouth of Gold Creek preserves a natural tide flat and creek delta, but elsewhere the city's shoreline is armored with rip-rap or steel sheet pile. Guided by a waterfront master plan, Juneau is developing a phased sea walk to renovate its waterfront, unite the city with its natural surroundings, and provide a destination for residents and visitors.

Habitat and Environment

Both the Juneau waterfront and the city as a whole must respond to the surrounding delicate ecosystem. A protected zone at the mouth of Gold Creek serves as migratory salmon habitat, and diverse marine flora can be seen at low tide. Out-migrating juvenile salmon require safe passage through the urban waterfront, and this has been provided as a result of Juneau's development. Because the extreme variation in Juneau's tide levels and long tide flats has necessitated ship moorage and boardwalks located significantly off shore, a shallow water shoreline bench remains undisturbed, and open water portals between boardwalks illuminate the water below. Combined, these assets improve salmon migration conditions along the city's waterfront while accommodating operational and loading requirements.

Public Use

Since Juneau has a large tourism industry, the downtown and waterfront are heavily used by cruise ship passengers, particularly between May and September. When ships are not in port, locals stroll and jog along the Steamship Dock, the Cold Storage/South Ferry Dock, and portions of the walkway behind the Merchant's Wharf, even without a formal public walkway in these locations. Expanded public recreation is desired along the waterfront, and parks,

plazas, promenades, and increased marina facilities are proposed in current planning documents.

Design and Construction

In 2004, the Long Range Waterfront Plan for the City and Borough of Juneau was released to the public. The document contains a history of the waterfront, planning issues, and a waterfront master plan with phasing and implementation strategies.



Public marina. Source: J. A. Brennan Associates

Lessons

- Incorporation of cruise ship terminal into public walkway
- Protected habitat zone for migrating salmon and other marine life
- Use of boardwalks to elevate structures, allowing illumination of salmon migration corridor and views of the marine ecosystem
- Multiple public recreation opportunities, such as marinas and promenades

Resources

2003 Long Range Waterfront Plan for the City and Borough of Juneau.

Prepared by Bermello, Ajamil & Partners, Inc.,
November 22, 2004.

www.juneau.org/plancomm/Final_LRWP_112204.php

Chicago Shoreline Protection Project – Chicago, Illinois



New stepped revetment and waterfront promenade. Source: Chicago Park District / MWH Global



Original revetment deterioration. Source: Chicago Park District / MWH Global



New stepped concrete and sheet pile revetment. Source: Chicago Park District / MWH Global

Basic Facts

Location: Chicago, Illinois, USA

Main points: shoreline protection, revetment design, flood and storm damage reduction, public water access, recreation, construction phasing

Size / length of waterfront: 8 miles of Lake Michigan shoreline

Year implemented: 5.8 miles constructed, with completion anticipated in 2015

Clients: US Army Corps of Engineers, City of Chicago Department of Environment, Chicago Park District

Cost: \$354 million

Relevant Issues

Habitat and Environment:

- Littoral drift
- Dune habitat re-creation
- Migratory bird habitat
- Tree protection and preservation

Public Use:

- Water access
- Gathering space
- Parkland and beaches
- Bicycle and pedestrian paths

Design and Construction:

- Shoreline stabilization—construction over the existing revetment
- Phasing to allow concurrent construction contracts
- Maintaining public access

Description: Chicago Shoreline Protection Project – Chicago, Illinois

Overview

Chicago's turn-of-the-century revetments have been degraded due to storm erosion and natural weathering, which led the City of Chicago Department of Environment and US Army Corps of Engineers to begin replacement of the eight-mile revetment. Stabilization of the shoreline is necessary to protect Lake Shore Drive, a federal highway, and the city's lakefront park land. The primary means of stabilization is a steel sheet pile-faced, stepped concrete revetment. In select areas, the stepped revetment is interrupted by rubble mound revetment and by beaches. Most of Chicago's beaches consist of natural, fine-grain sand captured from littoral drift with groins and protected by off-shore breakwaters. The project has also examined the creation of natural sand and gravel beaches with fore-dune, back-dune, and wetland habitats that occur naturally in undisturbed shoreline areas.

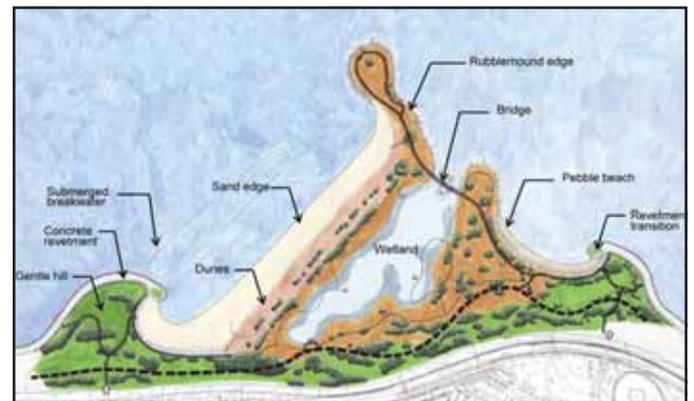
Habitat and Environment

Environmental improvements have focused on both aquatic and terrestrial improvements. In the water, submerged stone at the toe of the stepped revetment provides habitat for small freshwater fish, mussels, crayfish, and other aquatic life. The project presented an opportunity for the re-creation of Illinois' natural beach and dune habitat that has been largely lost to development. This habitat—consisting of beach, fore-dune, back-dune, wetland, and oak savanna or deciduous forest plant communities—requires a large amount of land and is being explored for one portion of the shoreline on the city's south side but has not yet been constructed. Because of the Lake Michigan shoreline's importance as a migratory bird corridor, parkland trees, shrubs, and forbs were selected to provide food and shelter for known migratory birds. Additionally, existing deciduous trees, including 100-year old oaks, maples, and elms, were protected and preserved throughout construction.

Public Use

Located in the heart of 23 miles of continuous public shoreline, creating an accessible and recreational waterfront was crucial to the project. Planning was coordinated with the master plans for Lincoln,

Grant, and Burnham Parks along the waterfront and included a public input process to protect and improve recreational access and use of the waterfront. The stepped revetment structure provides informal seating and a water-edge promenade for strolling, sun bathing, fishing, and gathering at events such as the annual air show, boat regattas, and fireworks displays. Periodic sloped walks between the stepped levels provide accessibility for people with disabilities. Along the promenade, ladders, throw buoys, and seiche cables (a cable one can grab onto in the instance of a large over-topping wave) were included for safety. Inland, an existing bicycle and pedestrian path was widened, enhanced, and rerouted to maintain use throughout construction. Beaches were established in areas with high access and visitor potential.



Proposed habitat beach. Source: Chicago Park District



New 42nd Street recreational beach. Source: Google Earth

While the project has been publicly successful, controversy arose over replacing a small segment of original revetment surrounding Promontory Point, a historic park. Debate continues as to whether or not the original revetment contributes to the park's historic significance; to date, this revetment has not been replaced.

Design and Construction

Construction is divided into multiple reaches and phased in order to address areas of highest need, coordinate with adjacent projects, maintain public access (especially during summer months), and allow multiple construction contracts. Because of the project's size, multiple contracts allow several contractors to work on the shoreline in different areas. The new stepped revetment is constructed by driving steel sheet piles on the water side of the existing revetment, creating a coffer dam where the new stepped concrete revetment can be formed, poured, and finished. In most areas, the existing revetment was left in place as fill, with some intact stone or concrete blocks salvaged for reuse elsewhere. Construction began in 1999 and will be complete in 2015.

Lessons

- Sheet pile and stepped concrete revetment structure employed through most of the eight-mile project, with greater design attention given to beaches and water touch points in high public use areas
- Stepped levels and waterfront promenade in revetment provide for recreation and wave energy deflection
- Sloped walks traversing the stepped revetment levels provide accessibility
- Ladders, throw buoys, and seiche cables included as safety measures
- Aquatic and terrestrial plant, animal, and migratory bird habitat developed
- Revetment construction provided opportunities for new parkland creation on fill areas and improvements to existing parkland and bicycle/pedestrian path
- Construction phased to allow multiple contracts and maintain public shoreline access

Resources

City of Chicago project summary.

www.cityofchicago.org/city/en/depts/cdot/provdrs/shoreline_protectionproject.html

“Rehabilitation of the Chicago Shoreline: A Coastal Engineering Perspective.”

Michael Krecic, P.E. Taylor Engineering, and Mark Wagstaff P.E. MWH Global.

Great Lakes Urban Habitat Symposium.

Chicago 2009 Morgan Shoal: Planning for a Sustainable Ecosystem & Shoreline Protection for Lake Michigan.

Rejman, Rob. Chicago Park District.

Waterfront Toronto, East Bayfront – Toronto, Canada



East Bayfront. Source: WATERFRONToronto



Stormwater management systems. Source: WATERFRONToronto



Basic Facts

Location: Toronto, Ontario, Canada

Main points: innovative stormwater management, brownfield development, urban design

Size / length of waterfront: 1 kilometer (0.6 miles)

Year implemented: ongoing as of autumn 2010

Client: City of Toronto

Cost: one of four districts within Waterfront Toronto Revitalization, which is \$15 billion CAN

Relevant Issues

Habitat and Environment:

- Innovative and integrated stormwater management
- New fish habitat

Public Use:

- Urban beach
- Promenade and boardwalk

Design and Construction:

- Brownfield redevelopment
- Art sculpture and UV stormwater treatment

Description: Waterfront Toronto, East Bayfront – Toronto, Canada

Overview

As part of a massive effort to transform and revitalize Toronto's waterfront, the East Bayfront neighborhood is an excellent example of sustainable urban design and multi-use public infrastructure. Industrial land is being rebuilt into an urban beach, lakefront promenade, public parks, and mixed-use developments. The revitalization is intended to showcase Toronto's "front porch," stimulate economic investment, create jobs, build communities, and improve the city's standard of living. East Bayfront also includes a new multi-use stormwater treatment facility. Part infrastructure, part landscape, and part art, the new facility brings water treatment into the public view. Serving as a model for community development worldwide, East Bayfront has achieved Stage 1 gold certification under the LEED-ND (neighborhood development) pilot program developed by the US Green Building Council.

Habitat and Environment

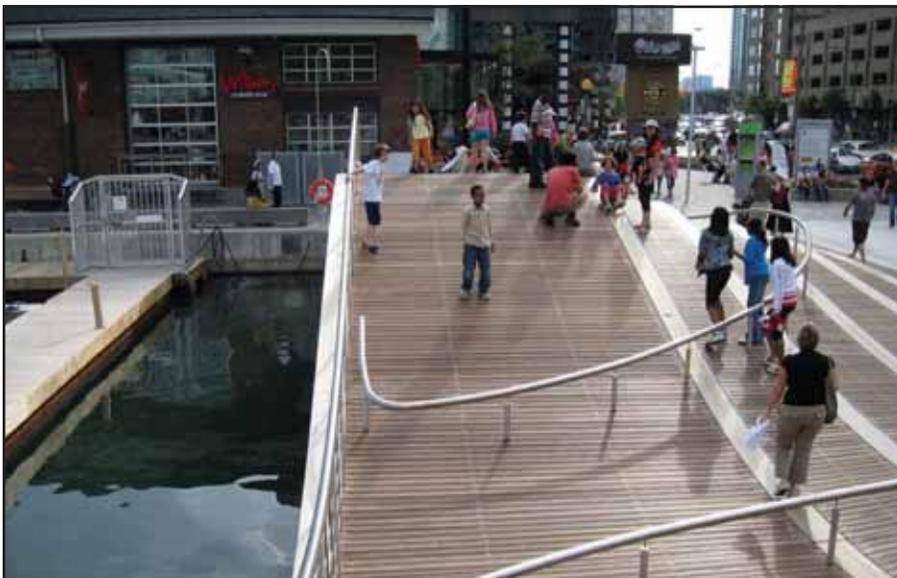
The most visible component of environmental stewardship in East Bayfront is the new stormwater management and treatment facility. Tanks beneath the boardwalk collect runoff after a storm event. The water is then transferred to a large tank under the

Parliament wave deck for initial treatment. The tank and wave deck include an artificial wetland and open water portals to allow natural light to reach and treat the water. The stormwater is then conveyed to the Sherbourne Common UV Purification Facility located underneath the park's pavilion. After the treatment process is complete, the water rises nearly 30 feet into one of three sculptures and falls gracefully into the water channel, where it then flows back to Lake Ontario.

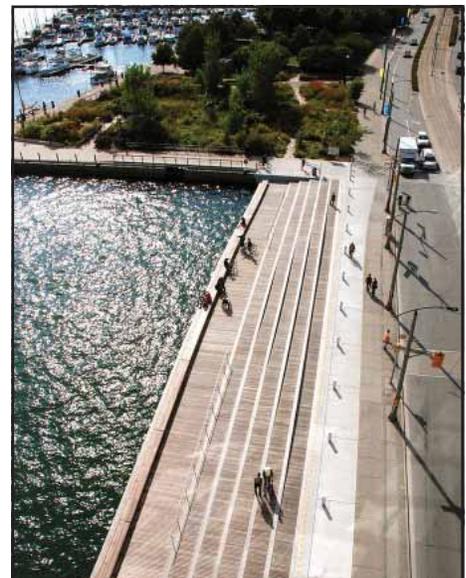
New fish habitat has been created along the stormwater management tanks beneath the boardwalk as well. River-stone shoals, embankments, and tree logs provide new shelter and improved foraging opportunities for lake fish. This aquatic habitat enhancement contributed to Waterfront Toronto's win of the Public Sector Quality Fair award.

Public Use

Twenty-five percent of East Bayfront's land is dedicated to parks and public spaces, and three parks and plazas are open today: Canada's Sugar Beach, the water's edge promenade, and Sherbourne Common. Canada's Sugar Beach was a former parking lot serving the industrial site. Now, the beach boasts



Toronto Central Waterfront boardwalk and open water area (near Eastbay Waterfront). Source: Flickr Silk Cut



Toronto Central Waterfront boardwalk and promenade (near Eastbay Waterfront). Source: Spacing Magazine

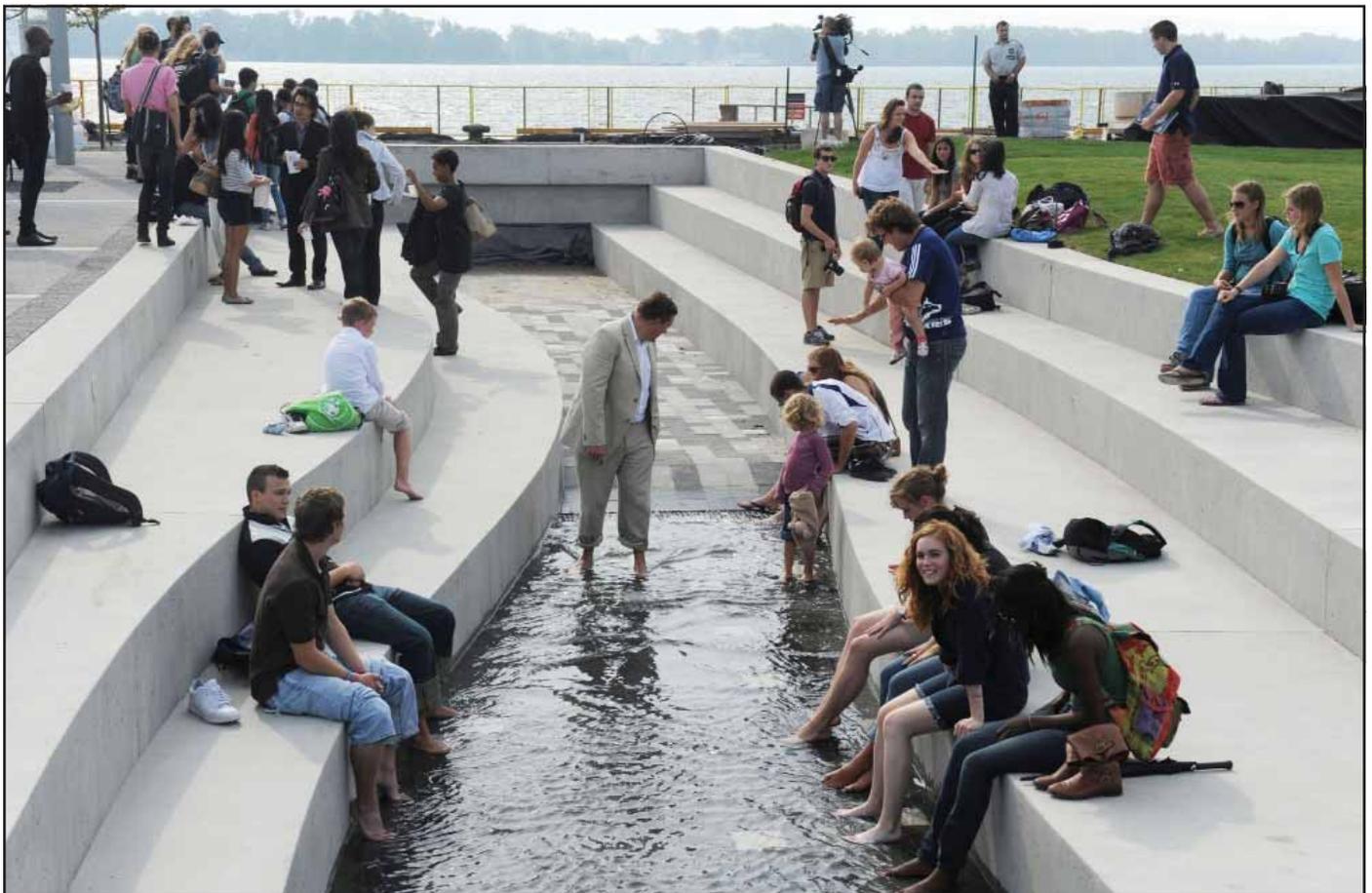
whimsical urban furniture, gorgeous lake views, a granite promenade, and a multi-functional plaza for festivals, performances, events, and casual strolling. The water's edge promenade consists of a crushed granite multi-use path with a parallel but slightly lower wood boardwalk. Surrounding the walk is a French-style allée created by rows of maturing maple trees, sheltering pedestrians from wind and sun. In 2010, the first 885 feet of promenade opened to the public, connecting Canada's Sugar Beach to Sherbourne Common. Eventually, the promenade and a wooden boardwalk built over the stormwater tanks will run the entire length of East Bayfront.

Sherbourne Common is a local park for East Bayfront and a regional amenity welcoming visitors from around the world. The new stormwater management system is central to this park, with the UV treatment facility, the waterfall sculptures, and the water channel connecting to Lake Ontario. The park's north side includes small, quiet places for relaxation,

play, and small events. The south side's ample space allows for festivals, concerts, and other large city events overlooking the lake. Public input was a major factor in the design of the park, and the park's name—Sherbourne Common—was chosen after a six-week public naming contest.

Design and Construction

Sustainable design and construction are major components of the East Bayfront development. As a result, the neighborhood has achieved Stage 1 Gold certification under the LEED-ND pilot program, one of the first in the world. Best management practices include recycled construction materials, easy access to public transportation, brownfield site revitalization, bicycle storage, and on-site stormwater management. Design details add to the overall site function. Open water portals in the wave deck allow UV light treatment of the stormwater below, while a web of rigid boxes filled with soil under the pavement (Silva cells) promote tree growth.



Sherbourne Common water channel. Source: WATERFRONToronto



Canada's Sugar Beach and Sherbourne Common artist renderings. Source: WATERFRONToronto

Lessons

- Stormwater treatment system fully integrated into development
 - Open water portals, waterfall sculptures, and open water channels highlight on-site stormwater treatment
 - Natural water treatment methods, biofiltration, and UV light employed
- Former industrial sites redeveloped into parks, plazas, promenades, educational institutions, retail, and residences
- Fish habitat designed in tandem with urban design elements and stormwater facility

Resources

Waterfront Toronto homepage.
www.waterfronttoronto.ca

“Hume: New waterfront park does double duty,”
The Toronto Star.
www.thestar.com/news/gta/article/778688--hume-new-waterfront-park-does-double-duty

City of Toronto.
www.toronto.ca/waterfront/

Making Waves: Principles for Building Toronto’s Waterfront (a summary).
www.toronto.ca/waterfront/pdf/making_waves_summary.pdf

Västra Hamnen – Malmö, Sweden



Bo01 in Västra Hamnen. Source: Nordic Centre for Spatial Development



Promenade at sunset. Source: Visit Sweden

Basic Facts

Location: Malmö, Sweden

Main points: popular promenade with water access, habitat features in urban setting

Size / length of waterfront: 300 meters (about 1,000 feet)

Year implemented: 2001

Client: City of Malmö

Cost: unknown

Relevant Issues

Habitat and Environment:

- Remediated soil
- Habitat features combined with urban elements

Public Use:

- Water touch points
- Historic and neighborhood context connections

Design and Construction:

- Promenade intended for multiple uses
- Sustainable features incorporated throughout development process

Description: Västra Hamnen – Malmö, Sweden

Overview

Västra Hamnen (“western harbor” in English) is a new district in Malmö’s reclaimed waterfront. The area was formerly the Kockums shipyards, one of the largest shipyards in Europe. After economic decline, Malmö began redeveloping its waterfront in the 1990s. Stemming from a housing exhibition by the same name, Bo01 (bo-noll-ett) is the first neighborhood to be developed within the greater Västra Hamnen district.

Bo01 serves as a showcase for sustainable design and development—both ecological and human. At each stage of development, the requirements for a healthy ecosystem are considered. However, those requirements are viewed within the human context: “How may this be both beautiful and environmental?”

Within Bo01, the buildings are powered by local and renewable resources, and visual diversity prevents the area from becoming a generic, master-planned suburb. Bird houses, bat boxes, and planters are incorporated, and small spaces for people to gather are in abundance.

Heavy emphasis is placed on the area’s proximity to Öresund. From the large buildings designed to block wind coming off the water to the inclusion of an immensely popular promenade and boardwalk, Västra Hamnen takes its ocean proximity into full account.

Habitat and Environment

The subtidal zone in Västra Hamnen was already rich in marine life, apart from one area where the canal meets the sea. Sediment containing toxic materials was removed from this area, and life is anticipated to flourish. Before construction, tests of the existing fill showed areas with high levels of toxic content. Nearly 6,000 cubic meters of soil were removed and replaced by clean class A soil, and topsoil quantity was increased in all areas.

Although many different private developers built Bo01, ecological design standards were maintained through required Green Points. Focusing on green materials, habitat features (such as butterfly flower beds or space for vegetables), energy consumption,

and other design considerations, the Green Points ensured that the neighborhood achieved a high development quality.

In Bo01, stormwater design is a major element. Stormwater is delayed first by green roofs and constructed ponds in urban spaces. The water then flows through open channels before returning to the sea. The open and visible waterways combined with lush plantings add a green quality to what might otherwise have been a sterile environment.

Public Use

Västra Hamnen is planned to house 10,000 people, with offices and university classrooms for 20,000 more. Currently, Bo01 boasts homes for about 1,000, with several large and small businesses established. However, there have been some criticisms about the affordability of housing. Further Västra Hamnen developments will focus more on this issue.



Waterfront promenade and over-water plaza. Source: TetraTech

The promenade is especially popular among Malmö's youth, who quickly substituted this area for the local beach as "the city's coolest meeting place." Bo01 has become the place to show off to visitors. Young people dive into the water while families paddle in the shallows. People stroll the promenade, enjoying the new cafés and shops while taking in the sun and sights. The promenade is also host to concerts, games, and other large events.

Design and Construction

Nearly 1,000 feet in length, the new promenade is built over a rock revetment along the shoreline, which had previously prevented public access to the water but protects the shoreline. The new promenade features seaside steps to reconnect with Öresund. The steps vary in tread width and height, allowing people to quickly reach the water or lounge in the sun and ocean views. The boardwalk itself is constructed of African azobe timber, an extremely hard and durable wood that is weather resistant with minimal treatment.

Lessons

- Habitat features, such as wildflower gardens and bird houses, included in urban design
- Water is accessible in multiple ways (swimming, diving, wading, viewing)
- Promenade designed for multiple uses (strolling, lounging)
- Boardwalk constructed on top of stone revetment
- Stormwater managed on site and returned to the sea in open channels

Resources

City of Malmö Official website.

www.malmo.se/English/Western-Harbour.html

"Visit Sweden."

www.visitsweden.com/sweden/Regions--Cities/Malmo/Coastline-experiences/Western-Harbour/

"Swede dreams," The Guardian.

Steve Rose

www.guardian.co.uk/artanddesign/2005/aug/29/architecture

"Malmö: Bo01 – an ecological city of tomorrow," case study, Sustainable Cities.

<http://sustainablecities.dk/en/city-projects/cases/malmo-bo01-an-ecological-city-of-tomorrow>

"Västra Hamnen in Malmö," Swedish Environmental Technology Council.

http://swentec.se/en/Start/find_cleantech/Plantscontainer/Vastra-hamnen-in-Malmo/

